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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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William M. Lee, Jr.
Lee, Mann, Smith, McWilliams, Sweeney & Ohlson
P.O. Box 2786
Chicago, IL 60690-2786

EXAMINER	
PATHAK, SUDHANSHU C	
ART UNIT	PAPER NUMBER
2634	

DATE MAILED: 06/28/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/849,927	HUDSON, JOHN E.	
	Examiner	Art Unit	
	Sudhanshu C. Pathak	2634	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *February 18th, 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-4,6-21 and 23-29* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4,6-21 and 23-29* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *Feburary 18th, 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. Claims 1-4, 6-21 & 23-29 are pending in the application.

2. Claims 5 & 22 have been canceled.

Claim Objections

3. Claim 27 is objected to because of the following informalities:

   Claim 27 disclose terms that are not further defined in the claims such as "STTD".

   Appropriate correction is required.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

   (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 1-2, 4, 6-14, 16, 19-21, 23-27 & 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over the Applicant Admitted Prior Art (AAPA) in view of DiToro (4,058,713).

Regarding to Claims 1, 8-13, 16, 19, 25, 26-27 & 29, the Applicant Admitted Prior Art (AAPA) discloses a wireless communications system comprising transceivers (cellular base station and subscriber handsets) for transmitting/receiving data (Specification, Page 2, lines 2-28). The AAPA also discloses implementing a downlink transmit diversity antennas (transmitting over a plurality of transmit antenna elements) to address fading and coloring of a channel through the use of space-time

transmit diversity (STTD) for non-dispersive channels (Specification, Page 2, lines 30-32 & Specification, Page 3, lines 1-8 & Specification, Page 7, lines 4-16). The AAPA also discloses the data stream is space-time coded (STC) (Specification, Page 2, lines 30-32 -to- Specification, Page 3, lines 1-8). The AAPA also discloses the communications system exhibits a frame structure containing a number of slots or packets wherein each packet is of a certain chips in length (Specification, Page 3, lines 19-25). The AAPA also discloses each packet containing at least one data portion(s) and at least one training sequence interspersed between the successive data portions (Specification, Page 3, lines 25-27). The AAPA also discloses implementing the training sequence to determine a channel impulse response for the channel equalization purposes (Specification, Page 3, lines 30-32 & Specification, Page 4, lines 1-2). The AAPA also discloses data stream is arranged such that a code-word level construction of an STTD transmitted signal is modified to a chip-level construction in which CDMA code words are interleaved at a chip level instead of being transmitted whole in sequence (Specification, Page 3, lines 19-32 & Specification, Page 4, lines 1-12). However, the AAPA does not disclose generating via a fast transform a packet spectrum of at least a portion of the data stream, the packet spectrum being a transform domain representation; generating via a fast transform a channel impulse response spectrum in the transform domain for the channel impulse response; equalizing the packet spectrum with the channel impulse response spectrum to produce an equalized packet spectrum in the transform

domain; and converting the equalized packet spectrum into time domain equalized data for recovery of information.

DiToro disclose generating via a fast transform a packet spectrum of at least a portion of the data stream, the packet spectrum being a transform domain representation; generating via a fast transform a channel impulse response spectrum in the transform domain for the channel impulse response; equalizing the packet spectrum with the channel impulse response spectrum to produce an equalized packet spectrum in the transform domain; and converting the equalized packet spectrum into time domain equalized data for recovery of information (Abstract, lines 1-6, 9-15 & Fig. 4, elements 41-42 & Fig. 6A-B & Fig. 7A-J & Column 2, lines 7-40 & Column 4, lines 10-39 & Column 5, lines 1-12 & Column 7, lines 5-22 & Column 8, lines 4-63 & Column 9, lines 1-68 & Column 10, lines 1-58 & Claim 4). DiToro also discloses the fast transform to be a Fourier transform (Fig. 4, element 42 & Fig. 6A-B, elements 50a-c & Column 2, lines 1-4 & Column 4, lines 15-24). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention that DiToro teaches an equalization process implemented in the frequency domain and this can be implemented in the receiver as described in the communication as described in the AAPA so as to accurately recover the transmitted signal in the receiver by minimizing the computational complexity of the equalization process.

Regarding to Claims 2, 14 & 20, the AAPA in view of DiToro discloses a method of channel equalization comprising generating via a fast transform a packet

spectrum of at least a portion of the data stream, the packet spectrum being a transform domain representation; generating via a fast transform a channel impulse response spectrum in the transform domain for the channel impulse response; equalizing the packet spectrum with the channel impulse response spectrum to produce an equalized packet spectrum in the transform domain; and converting the equalized packet spectrum into time domain equalized data for recovery of information as described above. DiToro further discloses equalizing the packet spectrum further comprising deconvolving transmitted and received data streams with respect to channel impulse response spectra, thereby to produce at least one equalized data stream (Column 1, lines 60-68 & Column 2, lines 1-4). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention that the AAPA in view of DiToro satisfies the limitation of the claim.

Regarding to Claims 4 & 21, the AAPA in view of DiToro discloses a method of channel equalization comprising generating via a fast transform a packet spectrum of at least a portion of the data stream, the packet spectrum being a transform domain representation; generating via a fast transform a channel impulse response spectrum in the transform domain for the channel impulse response; equalizing the packet spectrum with the channel impulse response spectrum to produce an equalized packet spectrum in the transform domain; and converting the equalized packet spectrum into time domain equalized data for recovery of information as described above. DiToro also discloses determining the length of the complex fourier coefficients depending on the precision of the receiver to which the receiver

must be held and size of the associated memories and the coefficients can be varied to suit different requirements of accuracy (Column 4, lines 6-24 & Column 8, lines 38-46). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention that the AAPA in view of DiToro satisfies the limitations of the claim. Furthermore, even though DiToro does not disclose truncating the channel impulse response spectra to limit the processing, this is a matter of design choice and depending on the accuracy and cost desired, the truncating of the spectra is determined.

Regarding to Claims 6, 15 & 23, the AAPA in view of DiToro discloses a method of channel equalization comprising generating via a fast transform a packet spectrum of at least a portion of the data stream, the packet spectrum being a transform domain representation; generating via a fast transform a channel impulse response spectrum in the transform domain for the channel impulse response; equalizing the packet spectrum with the channel impulse response spectrum to produce an equalized packet spectrum in the transform domain; and converting the equalized packet spectrum into time domain equalized data for recovery of information as described above. The AAPA also discloses assessing the channel impulse response for the channel based on the training sequence further includes assessing a matrix-valued channel impulse response (Specification, Page 7, lines 3-17). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention that the AAPA in view of DiToro satisfies the limitations of the claim.

Regarding to Claims 7 & 24, the AAPA in view of DiToro discloses a method of channel equalization comprising generating via a fast transform a packet spectrum of at least a portion of the data stream, the packet spectrum being a transform domain representation; generating via a fast transform a channel impulse response spectrum in the transform domain for the channel impulse response; equalizing the packet spectrum with the channel impulse response spectrum to produce an equalized packet spectrum in the transform domain; and converting the equalized packet spectrum into time domain equalized data for recovery of information as described above. The AAPA also discloses receiving the data stream at a plurality of receive antenna elements (Specification, Page 2, lines 30-32 & Specification, Page 3, lines 1-8 & Specification, Page 6, lines 15-28). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention that the AAPA in view of DiToro satisfies the limitations of the claim.

6. Claims 3 & 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over the Applicant Admitted Prior Art (AAPA) in view of DiToro (4,058,713) in further view of Perreault (4,141,072).

Regarding to Claim 3 & 28, the AAPA in view of DiToro discloses a method of channel equalization comprising generating via a fast transform a packet spectrum of at least a portion of the data stream wherein the data stream generated is a space time coded (STC) data stream, the packet spectrum being a transform domain representation; generating via a fast transform a channel impulse response spectrum in the transform domain for the channel impulse response; equalizing the

packet spectrum with the channel impulse response spectrum to produce an equalized packet spectrum in the transform domain; and converting the equalized packet spectrum into time domain equalized data for recovery of information as described above. However, the AAPA in view of DiToro does not disclose equalizing the packet spectrum includes performing a minimum mean square error (MMSE) spectral ratio comparison.

Perreault discloses an automatic equalizer for calculating the equalization transfer function of the transmission channel and applying the same to equalize the received signals, furthermore the equalization coefficients are obtained using a mean square error criteria for convergence to the desired values (Abstract, lines 1-5 & Column 1, lines 50-55). Perreault also discloses providing a frequency domain representation of the received signals, adjusting the frequency domain representation then means for generating a time domain representation of the adjusted frequency domain representation (Column 2, lines 4-10). Perreault also discloses generating a correction signal associated with the minimum mean square error of said received signal and means for adjusting the frequency domain representation with the correction signal (Column 2, lines 12-27 & Column 5, lines 61-68 & Column 6, lines 1-12 & Fig. 5). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention that Perreault teaches implementing a frequency domain equalizer utilizing a minimum mean square error and this and this can be implemented in the receiver as described in the

communication as described in the AAPA so as to provide a criteria for minimizing the error and accurately equalize the channel.

7. Claims 17 & 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over the Applicant Admitted Prior Art (AAPA) in view of DiToro (4,058,713) in further view of Yen et al. (4,707,841).

Regarding to Claim 17, the Applicant Admitted Prior Art (AAPA) discloses a wireless communications system comprising transceivers (cellular base station and subscriber handsets) for transmitting/receiving data (Specification, Page 2, lines 2-28). The AAPA also discloses implementing a downlink transmit diversity antennas (transmitting over a plurality of transmit antenna elements) to address fading and coloring of a channel through the use of space-time transmit diversity (STTD) for non-dispersive channels (Specification, Page 2, lines 30-32 & Specification, Page 3, lines 1-8 & Specification, Page 7, lines 4-16). The AAPA also discloses the data stream is space-time coded (STC) (Specification, Page 2, lines 30-32 –to-Specification, Page 3, lines 1-8). The AAPA also discloses the communications system exhibits a frame structure containing a number of slots or packets wherein each packet is of a certain chips in length (Specification, Page 3, lines 19-25). The AAPA also discloses each packet containing at least one data portion(s) and at least one training sequence interspersed between the successive data portions (Specification, Page 3, lines 25-27). The AAPA also discloses implementing the training sequence to determine a channel impulse response for the channel equalization purposes (Specification, Page 3, lines 30-32 & Specification, Page 4,

lines 1-2). The AAPA also discloses data stream is arranged such that a code-word level construction of an STTD transmitted signal is modified to a chip-level construction in which CDMA code words are interleaved at a chip level instead of being transmitted whole in sequence (Specification, Page 3, lines 19-32 & Specification, Page 4, lines 1-12). However, the AAPA does not disclose generating via a fast transform a packet spectrum of at least a portion of the data stream, the packet spectrum being a transform domain representation; generating via a fast transform a channel impulse response spectrum in the transform domain for the channel impulse response; equalizing the packet spectrum with the channel impulse response spectrum to produce an equalized packet spectrum in the transform domain; and converting the equalized packet spectrum into time domain equalized data for recovery of information.

DiToro disclose generating via a fast transform a packet spectrum of at least a portion of the data stream, the packet spectrum being a transform domain representation; generating via a fast transform a channel impulse response spectrum in the transform domain for the channel impulse response; equalizing the packet spectrum with the channel impulse response spectrum to produce an equalized packet spectrum in the transform domain; and converting the equalized packet spectrum into time domain equalized data for recovery of information (Abstract, lines 1-6, 9-15 & Fig. 4, elements 41-42 & Fig. 6A-B & Fig. 7A-J & Column 2, lines 7-40 & Column 4, lines 10-39 & Column 5, lines 1-12 & Column 7, lines 5-22 & Column 8, lines 4-63 & Column 9, lines 1-68 & Column 10, lines 1-58 & Claim 4).

DiToro also discloses the fast transform to be a Fourier transform (Fig. 4, element 42 & Fig. 6A-B; elements 50a-c & Column 2, lines 1-4 & Column 4, lines 15-24). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention that DiToro teaches an equalization process implemented in the frequency domain and this can be implemented in the receiver as described in the communication as described in the AAPA so as to accurately recover the transmitted signal in the receiver by minimizing the computational complexity of the equalization process. However, the AAPA in view of DiToro does not disclose an integrated chip having a controller programmed to provide a channel equalization function.

Yen discloses an integrated chip having a controller programmed to provide a channel equalization function (Fig. 1, elements 40, 48 & Column 1, lines 15-20 & Column 4, lines 17-25, 44-48 & Column 7, lines 59-65 & Column 8, lines 41-54). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention that Yen teaches implementing an equalizer in an integrated chip having a controller programmed to provide a channel equalization function, and the equalizer as described in the AAPA in view of DiToro so as to provide a small, low cost and portable modem for data transmission, thus satisfying the limitation of the claim.

Regarding to Claim 18, the AAPA in view of DiToro in further view of Yen discloses a method of channel equalization comprising generating via a fast transform a packet spectrum of at least a portion of the data stream, the packet spectrum being a transform domain representation; generating via a fast transform a

channel impulse response spectrum in the transform domain for the channel impulse response; equalizing the packet spectrum with the channel impulse response spectrum to produce an equalized packet spectrum in the transform domain; and converting the equalized packet spectrum into time domain equalized data for recovery of information implemented in an integrated chip having a controller programmed to provide channel equalization as described above. DiToro further discloses equalizing the packet spectrum further comprising deconvolving transmitted and received data streams with respect to channel impulse response spectra, thereby to produce at least one equalized data stream (Column 1, lines 60-68 & Column 2, lines 1-4). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention that the AAPA in view of DiToro satisfies the limitation of the claim.

Response to Arguments

8. Applicant's arguments with respect to claims 1-4, 6-21 & 23-29 filed on February 18th, 2005 have been fully considered but they are not persuasive. The amended independent claims with the limitation ".....receiving a data stream generated from a plurality of space time coded (STC) data streams received from a plurality of transmit antenna elements.....", this limitation is disclosed in the Applicant Admitted Prior Art (AAPA) on Page 2, lines 30-32 -to- Page 3, lines 1-8 (further referencing "Space Time Block Coded Transmit Antenna Diversity for WCDMA"; Dabak et al.; October 1998) and was included in the previous office action.

Indeed the DiToro reference (4,058,713) had not been relied upon to provide this limitation.

9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Conclusion

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sudhanshu C. Pathak whose telephone number is (571)-272-3038. The examiner can normally be reached on M-F: 9am-6pm.

- If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen Chin can be reached on (571)-272-3056
- The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

- Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Sudhanshu C. Pathak

STEPHEN CHIN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600